e-ISSN: 0975-1556, p-ISSN:2820-2643

Available online on www.ijpcr.com

International Journal of Pharmaceutical and Clinical Research 2024; 16(6); 157-165

Original Research Article

An Observational Study on Effect of Dexmedetomidine on Postoperative Emergence Delirium in Children Undergoing Tonsillectomy with Propofol Anaesthesia

Kanchan Ravindra Rupwate[1], Saarani Guha Sarkar[2], Akshata Pawar[3]

[1]Additional Professor, Department of Anesthesiology, LTMMC & LTMGH, Sion, Mumbai, Maharashtra, India

[2]Clinical Associate, Department of Anesthesiology, Jaslok Hospital and Research Centre, Mumbai, Maharashtra, India

[3]Senior Resident, Department of Anesthesiology, SDM College of Medical Sciences and Hospital, Sattur, Dharwad, Karnataka, India

Received: 25-03-2024 / Revised: 23-04-2024 / Accepted: 26-05-2024
Corresponding Author: Dr. Saarani Guha Sarkar
Conflict of interest: Nil

Abstract:

Background: Tonsillectomy is a common surgical procedure in children, often associated with high incidence of emergence delirium (ED), which can lead to postoperative airway obstruction and respiratory distress. This study aims to evaluate the effect of dexmedetomidine on the incidence and severity of postoperative emergence delirium in children undergoing tonsillectomy with propofol anesthesia.

Materials and Methods: This prospective observational comparative study was conducted at a tertiary health center from November 2018 to August 2020. Seventy children aged 4 to 12 years undergoing tonsillectomy with or without adenoidectomy were included. They were divided into two groups: Group D (35 children) received dexmedetomidine infusion at 0.5µg/kg/hr along with propofol anesthesia, while Group C (35 children) received only propofol anesthesia. Heart rate, systolic and diastolic blood pressure, oxygen saturation, and end-tidal CO2 levels were monitored intraoperatively. Postoperatively, emergence delirium was assessed using the WATCHA scale at 0, 15, 30, 45, 60, 90, and 120 minutes. Pain was assessed using VAS score (for children ≥8 years) and FACES scale (for children <8 years). Extubation time and additional analgesic requirements were also recorded.

Results: The incidence of ED was significantly lower in Group D at 0 minutes (P<0.001), 15 minutes (P<0.001), 30 minutes (P=0.008), and 45 minutes (P=0.012). Heart rate was lower in Group D at 45 minutes (P<0.001), 60 minutes (P=0.027), and 75 minutes (P<0.001). Systolic blood pressure was lower in Group D at 45 minutes (P=0.002), 60 minutes (P<0.001), 75 minutes (P<0.001), and 90 minutes (P=0.018). VAS scores at the end of 2 hours were zero for 82.8% in Group D compared to 62.8% in Group C. FACES scores showed significant differences at 0 minutes (P=0.045), 5 minutes (P=0.011), 15 minutes (P=0.030), and 30 minutes (P=0.010). The requirement for opioid analgesia was higher in Group C both intraoperatively and postoperatively.

Conclusion: Dexmedetomidine infusion at 0.5µg/kg/hr effectively reduces the incidence and severity of emergence delirium in children undergoing tonsillectomy with propofol anesthesia. It provides stable hemodynamics without prolonging extubation time and reduces the need for additional opioid analgesia.

Keywords: Tonsillectomy, Emergence Delirium, Dexmedetomidine, Propofol Anesthesia, Pediatric Surgery, Postoperative Analgesia.

Introduction

Tonsillectomy is one of the most frequently performed surgical procedures in children [1]. Pediatric patients undergoing tonsillectomy have a high incidence of emergence delirium (ED), which increases the risk of postoperative airway obstruction and respiratory distress due to the anatomical characteristics of the operative location and increased susceptibility to opioid analgesia [2]. During the recovery period, children may injure themselves, remove intravenous (IV) catheters, and damage surgical sites [3]. Postoperative pain can be severe after tonsillectomy, which itself can present as postoperative emergence delirium (POED), making the provision of effective and safe analgesia in this patient group challenging. Emergence delirium (ED) is characterized by involuntary agitation, including kicking, shouting, crying, lack of eye contact with caregivers or parents, inconsolability, uncooperativeness, and lack of awareness of surroundings. It is considered a

postoperative neurologic complication, affecting 10%-80% of children undergoing general anesthesia [3].

Factors such as preschool age, preoperative anxiety, otorhinolaryngologic and ophthalmic surgery, and rapid emergence from anesthesia have been associated with an increased risk of POED. Although it occurs for a short duration, it may require pharmacological intervention, resulting in a prolonged post-anesthesia care unit stay [4].

Different drugs, including opioid analgesics, benzodiazepines, and α2-adrenergic receptor agonists like clonidine, have been used in clinical settings for the prevention or treatment of established POED, with variable effects.

The risk of ED can be reduced with dexmedetomidine [3]. Dexmedetomidine is a selective alpha-2 receptor agonist that acts on the locus coeruleus in the pons, a key part of the brain responsible for regulating arousal and sleep. By affecting the brainstem locus coeruleus α2 adrenergic receptors, dexmedetomidine produces sedative, hypnotic, and anxiolytic effects and has anesthetic-sparing effects without significant respiratory depression.

This present observational study aims to investigate the occurrence and severity of emergence delirium in children undergoing tonsillectomy with propofol anesthesia, with or without dexmedetomidine infusion.

Materials and Methods

Study Design and Setting: This prospective observational comparative study was conducted at the E.N.T Operation Theatre of a tertiary health center from November 2018 to August 2020. The study aimed to observe the effect of dexmedetomidine on postoperative emergence delirium (POED) in children undergoing tonsillectomy with propofol anesthesia.

Study Population: A total of 70 children aged 4 to 12 years were included in the study. The children were divided into two groups: the dexmedetomidine group (Group D) and the control group (Group O), with 35 children in each group. Inclusion criteria were children of both genders, cooperative, and classified as ASA Risk I-II.

Exclusion criteria included refusal of parental/guardian consent, presence of congenital anomalies, other comorbidities including obstructive sleep apnea, and anticipated difficult intubation.

Sample Size Calculation: Based on the literature data and statistical considerations, a minimum sample size of 60 was determined to be sufficient for the study. However, a total of 70 patients were included to account for any potential dropouts, with 35 children in each group.

Preoperative Preparation: After obtaining informed consent from the parents or guardians, children were thoroughly evaluated for fitness for general anesthesia. Baseline information and relevant investigations were checked.

Anesthesia and Intraoperative Management: All children received standard institutional general anesthesia. Preoxygenation was performed using a facemask with oxygen for 3 minutes. Premedication included injection glycopyrrolate 0.004 µg/kg, IV midazolam 0.02 mg/kg, and IV fentanyl 2 µg/kg. Anesthesia induction was achieved with IV propofol 2-3 mg/kg in slow graded doses until loss of verbal contact, followed by IV vecuronium 0.1 mg/kg. Maintenance of anesthesia involved O2+N2O+infusion propofol 4-6 mg/kg/hr and fentanyl 0.5-1 mg/kg/hr.

Group D received an additional infusion of dexmedetomidine at 0.5 µg/kg/hr, which was continued until 15 minutes before the end of the surgery. Injection paracetamol 15 mg/kg IV was administered 30 minutes after induction for multimodal analgesia. In both groups, propofol infusion was stopped 10 minutes before the end of surgery.

Standard postoperative medications included injection dexamethasone 0.16 mg/kg IV, injection ondansetron 0.08 mg/kg IV, and 10% local lignocaine spray in both tonsillar fossae. At the end of surgery, neuromuscular block was reversed with IV glycopyrrolate 0.008 µg/kg and IV neostigmine 0.06 mg/kg. Patients were extubated upon achieving normal respiratory patterns and stable hemodynamics.

Postoperative Monitoring and Assessment: In the post-anesthesia care unit (PACU), the presence and severity of emergence delirium were assessed using the WATCHA scale at various intervals (0, 5, 15, 30, 45, 60, 90, and 120 minutes). Pain was evaluated using the Visual Analogue Scale (VAS) for children older than 8 years and the FACES scale for children younger than 8 years at the same time intervals. Hemodynamic parameters including heart rate, systolic and diastolic blood pressure, oxygen saturation (SpO2), and end-tidal CO2 (ETCO2) were monitored intraoperatively and postoperatively. The need for additional postoperative analgesia and any side effects were noted.

Data Analysis: Statistical analysis was performed using independent t-tests for continuous variables and Wilcoxon sum rank tests for ordinal variables. The primary outcome was the incidence of POED, and secondary outcomes included the severity of POED, hemodynamic stability, time to extubation,

additional postoperative analgesia, and side effects. Statistical significance was set at $p<0.05$.

Results

This section presents the findings of the observational study on the effect of dexmedetomidine on postoperative emergence delirium in children undergoing tonsillectomy with propofol anaesthesia.

The results include demographic characteristics, intraoperative and postoperative physiological parameters, extubation time, and the assessment of postoperative pain and emergence delirium. (Table 1-19).

Table 1: Age (years) and Weight (kg) of Patients

Group	N	Mean Age ± SD	P-Value	Mean Weight ± SD	P-Value
Dexmedetomidine	35	9.53 ± 1.60	0.475	25.66 ± 7.47	0.404
Control	35	9.24 ± 1.73		24.20 ± 7.05	

Note: No statistically significant difference in age and weight distribution between the groups ($P > 0.05$).

Table 2: Gender Distribution of Patients

Sex	Dexmedetomidine	Control	Total	P-Value	Significant at 5% Level
Female	13	15	28	0.626	No
Male	22	20	42		

Note: No statistically significant difference in gender distribution ($P > 0.05$).

Table 3: Diagnosis of Patients

Diagnosis	Dexmedetomidine	Control
Grade II Tonsillar Enlargement	13 (37.1%)	10 (28.6%)
Grade III Tonsillar Enlargement	20 (57.1%)	21 (60.0%)
Grade IV Tonsillar Enlargement	2 (5.7%)	4 (11.4%)

Note: Majority of patients in both groups had Grade III Tonsillar Enlargement.

Table 4: Types of Surgery

Surgery	Dexmedetomidine	Control
Adenoidectomy + B/L Tonsillectomy	25 (71.4%)	27 (77.1%)
B/L Tonsillectomy	10 (28.6%)	8 (22.9%)

Table 5: Physiological Parameters

Parameter	Group	N	Mean ± SD	P-Value	Significant at 5% Level
Heart Rate	Dexmedetomidine	35	104.97 ± 7.17	0.276	No
	Control	35	102.80 ± 9.24		
Systolic Blood Pressure	Dexmedetomidine	35	113.77 ± 5.33	0.904	No
	Control	35	113.94 ± 6.48		
Diastolic Blood Pressure	Dexmedetomidine	35	73.43 ± 6.84	0.331	No
	Control	35	72.00 ± 5.27		

Note: No significant difference in baseline physiological parameters.

Table 6: Intraoperative Heart Rate

Time	Group	N	Mean ± SD	P-Value	Significant at 5% Level
0 min	Dexmedetomidine	35	97.20 ± 4.48	0.772	No
	Control	35	97.94 ± 11.72		
15 min	Dexmedetomidine	35	96.97 ± 4.46	0.882	No
	Control	35	96.71 ± 9.14		
30 min	Dexmedetomidine	35	94.63 ± 6.72	0.209	No
	Control	35	96.91 ± 8.28		
45 min	Dexmedetomidine	35	91.20 ± 5.91	<0.001	Yes
	Control	35	99.94 ± 9.52		
60 min	Dexmedetomidine	35	87.71 ± 4.83	0.027	Yes
	Control	35	94.69 ± 17.56		
75 min	Dexmedetomidine	35	85.66 ± 5.93	<0.001	Yes
	Control	35	94.29 ± 9.64		
90 min	Dexmedetomidine	5	87.60 ± 2.19	0.132	No
	Control	10	95.80 ± 11.09		
120 min	Dexmedetomidine	1	80.00	-	-
	Control	0	-	-	-

Note: Significantly lower heart rates in the dexmedetomidine group at 45 min, 60 min, and 75 min ($P < 0.05$).

Table 7: Intraoperative Systolic Blood Pressure

Time	Group	N	Mean ± SD	P-Value	Significant at 5% Level
0 min	Dexmedetomidine	35	111.89 ± 7.53	0.230	No
	Control	35	109.20 ± 10.73		
15 min	Dexmedetomidine	35	103.89 ± 4.99	0.580	No
	Control	35	105.09 ± 11.75		
30 min	Dexmedetomidine	35	104.80 ± 6.69	0.574	No
	Control	35	105.66 ± 5.97		
45 min	Dexmedetomidine	35	104.11 ± 8.01	0.002	Yes
	Control	35	109.94 ± 6.75		
60 min	Dexmedetomidine	35	101.03 ± 7.15	<0.001	Yes
	Control	35	108.11 ± 7.16		
75 min	Dexmedetomidine	35	100.23 ± 7.03	<0.001	Yes
	Control	35	106.12 ± 3.62		
90 min	Dexmedetomidine	5	102.40 ± 4.77	0.018	Yes
	Control	10	108.20 ± 4.77		
120 min	Dexmedetomidine	1	110.00	-	-
	Control	0	-	-	-

Note: Significantly lower systolic blood pressure in the dexmedetomidine group at 45 min, 60 min, 75 min, and 90 min ($P < 0.05$).

Table 8: Intraoperative Diastolic Blood Pressure

Time	Group	N	Mean ± SD	P-Value	Significant at 5% Level
0 min	Dexmedetomidine	35	72.06 ± 4.43	0.933	No
	Control	35	72.17 ± 6.75		
15 min	Dexmedetomidine	35	70.57 ± 4.41	0.057	No
	Control	35	74.29 ± 10.47		
30 min	Dexmedetomidine	35	73.63 ± 6.96	0.134	No
	Control	35	70.97 ± 7.69		
45 min	Dexmedetomidine	35	71.51 ± 4.80	0.755	No
	Control	35	72.00 ± 7.79		
60 min	Dexmedetomidine	35	70.57 ± 4.59	0.404	No
	Control	35	71.66 ± 6.13		
75 min	Dexmedetomidine	35	70.00 ± 4.80	0.024	Yes
	Control	35	72.94 ± 5.77		
90 min	Dexmedetomidine	5	71.60 ± 3.58	0.086	No
	Control	10	76.00 ± 4.62		
120 min	Dexmedetomidine	1	80.00	-	-
	Control	0	-	-	-

Note: Significantly lower diastolic blood pressure in the dexmedetomidine group at 75 min ($P < 0.05$).

Table 9: Intraoperative Saturation of Peripheral Oxygen (sPO2)

Time	Group	N	Mean ± SD	P-Value	Significant at 5% Level
0 min	Dexmedetomidine	35	99.94 ± 0.24	0.523	No
	Control	35	99.89 ± 0.47		
15 min	Dexmedetomidine	35	100.00 ± 0.00	1.000	No
	Control	35	100.00 ± 0.00		
30 min	Dexmedetomidine	35	99.86 ± 0.43	0.053	No
	Control	35	100.00 ± 0.00		
45 min	Dexmedetomidine	35	100.00 ± 0.00	1.000	No
	Control	35	100.00 ± 0.00		
60 min	Dexmedetomidine	35	100.00 ± 0.00	1.000	No
	Control	35	100.00 ± 0.00		
75 min	Dexmedetomidine	35	99.86 ± 0.36	0.022	Yes
	Control	35	100.00 ± 0.00		
90 min	Dexmedetomidine	5	100.00 ± 0.00	1.000	No
	Control	10	100.00 ± 0.00		
120 min	Dexmedetomidine	1	100.00	-	-
	Control	0	-	-	-

Note: No significant difference in oxygen saturation except at 75 min (P < 0.05).

Table 10: Extubation Time

Group	N	Mean ± SD	P-Value	Significant at 5% Level
Dexmedetomidine	35	324 sec ± 18 sec	0.055	No
Control	35	316 sec ± 16 sec		

Note: No significant difference in extubation time between the groups.

Table 11: WATCHA Scale at Regular Time Intervals in PACU

Time	Group	N	Mean ± SD	Median	P-Value	Significant at 5% Level
0 min	Dexmedetomidine	35	1.97 ± 0.64	2.0	<0.001	Yes
	Control	35	2.89 ± 0.90	3.0		
15 min	Dexmedetomidine	35	1.61 ± 0.56	2.0	<0.001	Yes
	Control	35	2.63 ± 0.73	3.0		
30 min	Dexmedetomidine	35	1.42 ± 0.61	1.0	0.008	Yes
	Control	35	1.86 ± 0.65	2.0		
45 min	Dexmedetomidine	35	1.09 ± 0.38	1.0	0.012	Yes
	Control	35	1.31 ± 0.53	1.0		
60 min	Dexmedetomidine	35	0.88 ± 0.42	1.0	0.405	No
	Control	35	0.80 ± 0.53	1.0		
75 min	Dexmedetomidine	35	0.67 ± 0.48	1.0	0.468	No
	Control	35	1.00 ± 1.51	1.0		
90 min	Dexmedetomidine	35	0.48 ± 0.51	0.0	0.820	No
	Control	35	0.51 ± 0.61	0.0		
120 min	Dexmedetomidine	34	0.93 ± 0.24	1.0	0.026	Yes
	Control	35	0.74 ± 0.44	1.0		

Note: Significantly lower WATCHA scores in the dexmedetomidine group at 0 min, 15 min, 30 min, 45 min, and 120 min (P < 0.05).

Table 12: Heart Rate in PACU

Time	Group	N	Mean ± SD	P-Value	Significant at 5% Level
0 min	Dexmedetomidine	35	89.54 ± 5.94	<0.001	Yes
	Control	35	106.63 ± 7.64		
15 min	Dexmedetomidine	35	89.40 ± 7.26	<0.001	Yes
	Control	35	102.91 ± 8.06		
30 min	Dexmedetomidine	35	89.89 ± 9.65	0.002	Yes
	Control	35	96.23 ± 6.56		
45 min	Dexmedetomidine	35	86.11 ± 5.42	<0.001	Yes
	Control	35	93.49 ± 5.12		
60 min	Dexmedetomidine	35	85.03 ± 4.53	<0.001	Yes
	Control	35	91.43 ± 5.17		
75 min	Dexmedetomidine	35	85.89 ± 4.63	<0.001	Yes
	Control	35	90.86 ± 5.02		
90 min	Dexmedetomidine	35	86.17 ± 4.69	<0.001	Yes
	Control	35	91.20 ± 6.25		
120 min	Dexmedetomidine	34	86.53 ± 4.24	0.001	Yes
	Control	35	90.69 ± 5.68		

Note: Significantly lower heart rates in the dexmedetomidine group at all postoperative time points (P < 0.05).

Table 13: Systolic Blood Pressure (SBP) in PACU

Time	Group	N	Mean ± SD	P-Value	Significant at 5% Level
0 min	Dexmedetomidine	35	109.60 ± 5.88	0.003	Yes
	Control	35	114.34 ± 6.82		
15 min	Dexmedetomidine	35	104.74 ± 4.68	<0.001	Yes
	Control	35	113.31 ± 8.50		
30 min	Dexmedetomidine	35	103.71 ± 5.78	0.167	No
	Control	35	105.83 ± 6.85		
45 min	Dexmedetomidine	35	102.63 ± 6.43	0.559	No
	Control	35	103.54 ± 6.58		

60 min	Dexmedetomidine	35	99.49 ± 3.74	0.001	Yes
	Control	35	104.00 ± 6.58		
75 min	Dexmedetomidine	35	100.57 ± 5.91	0.306	No
	Control	35	102.03 ± 5.90		
90 min	Dexmedetomidine	35	101.03 ± 6.85	0.008	Yes
	Control	35	105.49 ± 6.76		
120 min	Dexmedetomidine	34	100.53 ± 4.63	0.001	Yes
	Control	35	105.09 ± 6.30		

Note: Significantly lower systolic blood pressure in the dexmedetomidine group at 0 min, 15 min, 60 min, 90 min, and 120 min ($P < 0.05$).

Table 14: Diastolic Blood Pressure (DBP) in PACU

Time	Group	N	Mean ± SD	P-Value	Significant at 5% Level
0 min	Dexmedetomidine	35	73.89 ± 4.97	0.839	No
	Control	35	73.66 ± 4.41		
15 min	Dexmedetomidine	35	72.06 ± 3.09	0.651	No
	Control	35	71.60 ± 5.08		
30 min	Dexmedetomidine	35	71.49 ± 3.44	0.313	No
	Control	35	70.34 ± 5.69		
45 min	Dexmedetomidine	35	70.40 ± 3.39	0.852	No
	Control	35	70.57 ± 4.22		
60 min	Dexmedetomidine	35	69.60 ± 3.90	0.227	No
	Control	35	70.74 ± 3.94		
75 min	Dexmedetomidine	35	70.97 ± 4.59	0.605	No
	Control	35	71.89 ± 9.34		
90 min	Dexmedetomidine	35	69.43 ± 4.13	0.378	No
	Control	35	70.34 ± 4.48		
120 min	Dexmedetomidine	34	70.88 ± 3.31	0.601	No
	Control	35	71.49 ± 5.85		

Note: No significant difference in diastolic blood pressure between the groups.

Table 15: SpO2 in PACU at Regular Time Intervals

Time	Group	N	Mean ± SD	P-Value	Significant at 5% Level
0 min	Dexmedetomidine	35	99.97 ± 0.17	0.321	No
	Control	35	100.00 ± 0.00		
15 min	Dexmedetomidine	35	99.77 ± 0.49	0.791	No
	Control	35	99.80 ± 0.41		
30 min	Dexmedetomidine	35	99.77 ± 0.43	0.103	No
	Control	35	99.91 ± 0.28		
45 min	Dexmedetomidine	35	99.83 ± 0.38	0.747	No
	Control	35	99.86 ± 0.36		
60 min	Dexmedetomidine	35	99.86 ± 0.43	1.000	No
	Control	35	99.86 ± 0.36		
75 min	Dexmedetomidine	35	99.80 ± 0.41	0.268	No
	Control	35	99.66 ± 0.64		
90 min	Dexmedetomidine	35	99.86 ± 0.36	0.770	No
	Control	35	99.83 ± 0.45		
120 min	Dexmedetomidine	34	100.00 ± 0.00	0.328	No
	Control	35	99.97 ± 0.17		

Note: No significant difference in oxygen saturation between the groups.

Table 16: VAS Score in PACU (Frequency)

VAS Score	Group	0 min	15 min	30 min	45 min	60 min	75 min	90 min	120 min
VAS Score = 0	Dexme-detomidine	0	0	0	4 (11.4%)	13 (37.1%)	18 (51.4%)	25 (71.4%)	29 (82.8%)
	Control	0	0	0	0	9(25.7%)	20(57.1%)	21(60.0%)	22(62.8%)
VAS Score = 1 to 3	Dexme-detomidine	8 (22.8%)	10(28.5%)	14 (40%)	24(68.5%)	17(48.5%)	12(34.2%)	4(11.4%)	0
	Control	3 (8.6%)	2(5.7%)	20(57.1%)	24(68.5%)	17(48.5%)	6(17.1%)	7(20.0%)	6(17.1%)
VAS Score = 4 to 6	Dexme-detomidine	22 (62.8%)	20(57.1%)	16(45.7%)	2(5.7%)	0	0	0	0
	Control	24 (68.5%)	26(74.2%)	8(22.8%)	4(11.4%)	2(5.7%)	2(5.7%)	0	0
VAS Score = 6 to 8	Dexme-detomidine	0	0	0	0	0	0	0	0
	Control	1 (2.9%)	0	0	0	0	0	0	0

Note: Initial VAS scores were more frequently assessed as 4 to 6 in both groups, gradually reducing to zero by the end of 2 hours.

Table 17: FACES Scale for Below 8 Years in PACU

Time	Group	N	Mean ± SD	Median	P-Value	Significant at 5% Level
0 min	Dexmedetomidine	5	6.40 ± 0.8944	6.0	0.045	Yes
	Control	6	7.67 ± 0.8165	8.0		
5 min	Dexmedetomidine	5	4.40 ± 0.8944	4.0	0.011	Yes
	Control	6	6.33 ± 0.8165	6.0		
15 min	Dexmedetomidine	5	4.00 ± 1.4142	4.0	0.030	Yes
	Control	6	6.00 ± 1.2649	6.0		
30 min	Dexmedetomidine	5	2.20 ± 1.0954	2.0	0.010	Yes
	Control	6	5.00 ± 1.0954	5.0		
45 min	Dexmedetomidine	5	2.20 ± 1.0954	2.0	0.764	No
	Control	6	2.33 ± 1.0328	2.0		
60 min	Dexmedetomidine	5	1.00 ± 1.0000	1.0	0.539	No
	Control	6	1.33 ± 1.0328	2.0		
90 min	Dexmedetomidine	5	0.00 ± 0.0000	0.0	0.080	No
	Control	6	0.83 ± 0.9832	0.5		
120 min	Dexmedetomidine	5	0.00 ± 0.0000	0.0	0.080	No
	Control	6	0.83 ± 0.9832	0.5		

Note: Significant difference in FACES scores at 0 min, 5 min, 15 min, and 30 min ($P < 0.05$).

Table 18: Any Drug Given for Analgesia Requirement (Intraoperative)

Group	Time	0 min	15 min	30min	45 min	60 min	75 min	90 min	120 min
Dexme-detomidine	Inj Fentanyl 0.5 mcg/kg	3 (8.6%)	0	2 (5.7%)	3 (8.6%)	0	0	0	0
Control	Inj Fentanyl 0.5 mcg/kg	0	5 (14.2%)	2 (5.7%)	4 (11.4%)	7 (20.0%)	1 (2.9%)	0	0
	Inj Fentanyl 1 mcg/kg	33 (94.3%)	3 (8.6%)	1 (2.9%)	0	0	0	0	0

Note: Higher frequency and dosage of fentanyl required in the control group.

Table 19: Any Drug Given for Analgesia or Emergence Delirium in PACU

Group	Time	0 min	15 min	30 min	45 min	60 min	75 min	90 min	120 min
Dexmedetomidine	Inj Tramadol 0.5 mg/kg iv	0	0	3 (8.6%)	1 (2.9%)	0	0	0	0
Control	Inj Tramadol 1 mg/kg iv	1 (2.9%)	0	0	0	0	0	0	0
	Inj Tramadol 1.5 mg/kg iv	0	10 (28.6%)	1 (2.9%)	0	0	0	0	0

Note: Higher frequency and dosage of tramadol required in the control group.

Overall, the results demonstrate that dexmedetomidine infusion effectively reduces the incidence and severity of postoperative emergence delirium in children undergoing tonsillectomy with propofol anaesthesia, without significant prolongation of extubation time or adverse hemodynamic effects.

Discussion

Tonsillectomy remains one of the most frequently performed surgical procedures in children, and the incidence of postoperative emergence delirium (POED) in this population is notably high, often leading to postoperative airway obstruction and respiratory distress due to the anatomical characteristics of the operative site and increased susceptibility to opioid analgesia [1].

Emergence delirium (ED) is characterized by involuntary agitation, including kicking, shouting, crying, and a lack of eye contact with caregivers, affecting 10%-80% of children undergoing general anesthesia [2].

The use of dexmedetomidine, a selective alpha-2 receptor agonist, has been shown to reduce the risk of ED by affecting the locus coeruleus of the pons, which regulates arousal and sleep [3].

The primary aim of this study was to assess the effect of dexmedetomidine on the incidence of POED in children undergoing tonsillectomy with propofol anesthesia. Our findings indicate that dexmedetomidine significantly reduces the incidence and severity of POED without significantly prolonging extubation time or causing adverse hemodynamic effects.

Demographic Characteristics: The mean age and weight of the study subjects were comparable between the dexmedetomidine and control groups, with no significant differences in gender distribution, consistent with findings by Erdil et al. [4] and Cao et al. [5]. This similarity in baseline characteristics helps to ensure the validity of our comparative analysis.

Intraoperative Hemodynamics: Dexmedetomidine administration was associated with significantly lower heart rates at 45, 60, and 75 minutes intraoperatively compared to the control group. These findings align with previous studies by Tsiotou et al. [3] and Cao et al. [5], who reported reduced heart rates in children receiving dexmedetomidine during surgery.

Additionally, systolic blood pressure was significantly lower in the dexmedetomidine group at several time points (45,60,75, and 90 minutes), corroborating the results of Patel et al. [6] and Cao et al. [5], who observed similar trends in their investigations. Diastolic blood pressure, however, did not show significant differences between the groups, suggesting that dexmedetomidine's effect is more pronounced on systolic measures.

Extubation Time: Our study found no significant difference in extubation time between the dexmedetomidine and control groups, consistent with Tsiotou et al. [3]. However, Soliman et al. [7] reported a longer extubation time in patients receiving dexmedetomidine, highlighting the need for further research to clarify this aspect.

Postoperative Monitoring: Postoperatively, dexmedetomidine was effective in maintaining lower heart rates and systolic blood pressure compared to the control group, with no significant differences in diastolic blood pressure or oxygen saturation levels.

The WATCHA scale scores indicated significantly lower POED in the dexmedetomidine group at multiple time points, which supports the findings of Tsiotou et al. [3] and Erdil et al. [4]. The VAS scores for pain were also lower in the dexmedetomidine group, indicating better pain management, consistent with previous studies [5,6].

Analgesic Requirements: The requirement for intraoperative and postoperative opioids was significantly lower in the dexmedetomidine group, reflecting its analgesic-sparing effects as reported by Cao et al. [5] and Guler et al. [8]. This reduction in opioid use is particularly beneficial in pediatric patients, who are at higher risk for opioid-induced respiratory depression.

Additionally, our study demonstrated that dexmedetomidine was effective in reducing the incidence of emergence delirium without significantly affecting the extubation time [9-11]. This discrepancy may be attributed to differences in

study design, patient population, and dosage protocols. Moreover, the consistent reduction in intraoperative and postoperative heart rates and systolic blood pressure, without significant changes in diastolic blood pressure, underscores the selective hemodynamic effects of dexmedetomidine [12]. These results are corroborated by the work of Tsiotou et al. [3] and Cao et al. [5], who observed similar trends in their studies on pediatric anesthesia.

Our findings are particularly relevant in the context of pediatric anesthesia, where minimizing opioid use is crucial due to the heightened risk of respiratory depression in children. The analgesic-sparing effects of dexmedetomidine, evidenced by the reduced intraoperative and postoperative opioid requirements in our study, align with previous reports by Cao et al. [5] and Guler et al. [8]. The potential of dexmedetomidine to enhance postoperative recovery by mitigating POED and providing effective pain management presents a significant advancement in pediatric anesthetic practice. Further research, particularly multicenter trials with larger sample sizes, is necessary to confirm these benefits and optimize dexmedetomidine dosing strategies in this vulnerable population [13-15].

Limitations:

The study's limitations include its single-center design and relatively small sample size of 70 children. Multicenter studies with larger sample sizes are needed to validate these findings further.

Conclusion

Dexmedetomidine infusion at 0.5 µg/kg/hr is effective in reducing the incidence and severity of POED in children undergoing tonsillectomy with propofol anesthesia.

It maintains stable hemodynamics intraoperatively and postoperatively without prolonging extubation time. Additionally, it reduces the need for opioid analgesia, making it a valuable agent in managing pediatric patients undergoing tonsillectomy.

References

1. Brown KA. Outcome, risk, and error and the child with obstructive sleep apnea. Paediatr Anaesth. 2011; 21(7):771-780.
2. Wells LT, Rasch DK. Emergence "delirium" after sevoflurane anesthesia: a paranoid delusion? Anesth Analg. 1999; 88(6):1308-1310.
3. Tsiotou AG, Malisiova A, Kalliardou P, et al. Dexmedetomidine for the reduction of emergence delirium in children undergoing tonsillectomy with propofol anaesthesia: A double-blind, randomized study. Pediatr Anesth. 2018; 28(6):632-638.
4. Erdil F, Demirbilek S, Begec Z, et al. The effects of dexmedetomidine and fentanyl on emergence characteristics after adenoidectomy in children. Anesth Analg. 2009; 109(2):472-475.
5. Cao JL, Pei Q, Mi WD. Effects of intraoperative dexmedetomidine on postoperative emergence agitation and recovery profiles in pediatric patients undergoing tonsillectomy. Int J Pediatr Otorhinolaryngol. 2016; 83:35-40.
6. Patel A, Davidson M, Tran MC, et al. Dexmedetomidine infusion for analgesia and emergence agitation in children with obstructive sleep apnea syndrome undergoing tonsillectomy and adenoidectomy. Anesth Analg. 2010; 111(4):1004-1010.
7. Soliman R, Habib M, Shalaby A, et al. Effect of dexmedetomidine on emergence agitation in children undergoing adenotonsillectomy under sevoflurane anesthesia. Saudi J Anaesth. 2015; 9(4):410-414.
8. Guler G, Akin A, Tosun Z, et al. Single dose dexmedetomidine reduces agitation and provides smooth extubation after pediatric adenotonsillectomy. Paediatr Anaesth. 2005; 15(9):762-766.
9. Kim HJ, Kim YH, Choi SH. Efficacy of dexmedetomidine in pediatric tonsillectomy: a systematic review and meta-analysis. Paediatr Anaesth. 2017;27(9):885-892.
10. Brown KA, Laferriere A, Moss IR. Recurrent hypoxemia in children is associated with increased opioid sensitivity. Anesthesiology. 2006;105(4):665-669.
11. Cho SY, Kim WJ, Jang YS. Effects of dexmedetomidine on emergence agitation and quality of recovery after pediatric tonsillectomy. Korean J Anesthesiol. 2015;68(6):502-508.
12. Mason KP, Zgleszewski SE, Dearden JL, Dumont RS, Pirich MA, Stark CD. Dexmedetomidine for pediatric sedation for computed tomography imaging studies. Anesth Analg. 2006;103(1):57-62.
13. Lin Y, Yi B, Peng X, Li L, Zhou S, Liu Y. Dexmedetomidine premedication prevents sevoflurane-induced emergence agitation in children with obstructive sleep apnea syndrome. Pediatr Anesth. 2014;24(8):834-840.
14. Yuen VM, Hui TW, Irwin MG, Yuen MK, Lee LH. A comparison of dexmedetomidine and midazolam for sedation in third molar surgery. Anaesthesia. 2008;63(11):1132-1138.
15. Sun Y, Xu H, Zhang Y, Liang H, Wang X. The effect of dexmedetomidine on postoperative analgesia in children undergoing tonsillectomy. J Clin Anesth. 2016; 33:185-189.